



Docket:  
90065.99R272/SE-1528PD

**IN THE UNITED STATES PATENT & TRADEMARK OFFICE**

Applicant: Jiffa Hao, et al.

Serial No.: 09/654,845

Filed: September 1, 2000

For: POWER SEMICONDUCTOR DEVICE  
WITH HIGH AVALANCHE CAPABILITY  
AND PROCESS FOR FORMING SAME

Examiner:  
Ori Nadav

Art Unit:  
2811

**RESPONSE TO OFFICE ACTION**

Assistant Commissioner For Patents  
Washington, DC 20231

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Dear Sir:

**REMARKS**

These remarks are submitted in response to the Office Action mailed April 4, 2002.

Claims 1-17 are pending. They are all rejected under 35 USC 103 as being unpatentable over one or more of the references including Schlangenotto (5,063,428), Schlangenotto (5,773,858) and Tokura (5,545,908). The following remarks will show that the rejection is not supported by the references and that the claims are patentable as filed.

Claim 1 is the only independent claim. It has several features that are not shown or suggested in the references either alone or in combination. These features include a range of thickness for the P<sup>-</sup> and P<sup>+</sup> doped layers. That range is between about 5  $\mu$ m to about 12  $\mu$ m. In addition, claim 1 requires that recombination centers of noble metal impurities are located in the N<sup>-</sup> dope and P<sup>-</sup> dope layers.

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The Office Action admits that neither of those features are shown by the references. Applicants fully agree with that portion of the rejection. Indeed, the references either alone or in combination did not show either of those limitations.

Since none of the references show those limitations, the rejection is *prima-facie* inadequate as a matter of law. In addition, applicants traverse the examiners unsupported assertion that thickness limitations and the location of the recombination centers in the N<sup>-</sup> and P<sup>+</sup> layers are obvious. In order to support an obviousness-type rejection, all the limitations of the claims must be found in one or more reference. See MPEP§ 2143 ("Finally, the prior art reference (or references when combined) must teach all the claim limitations.") Where the references do not show the limitations and the rejection broadly asserts that the limitation is obvious in view of the prior art, the rejection cannot be maintained if the Applicant traverses it. Here the Applicants traverse that rejection and request a specific reference that shows or suggests the claimed limitations and the alleged "well known" methods of the prior art. See MPEP§ 2144.03.

As for the thickness limitation, the rejection argues that known reductions in the *size* of semiconductors would lead those skilled in the art to the claimed range of the P<sup>-</sup> and P<sup>+</sup> layers. That is not so. The claimed range is less than a third the size of the range shown and the reference. As such, the reference is approximately 300 percent larger than the claimed range.

In addition, "the reduction in size" of semiconductors has to do with the length and width. Even if one assumes that the artist will try to reduce size, the assertion that the length and width of a semiconductor also mandates the corresponding reduction in the thickness of layers does not necessarily follow.

The location of recombination centers in the N- and P- layers is another limitation not shown by the references. The rejection also admits that the references do not show this limitation. However the rejection reasons that noble metal recombination centers located somewhere in the reference teach the *specific location* set forth in the claims.

That assertion is clearly erroneous. It would lead to the erroneous conclusion that a generic disclosure of necessity discloses all species. This is contrary to well accepted patent law. It is also contrary to reason. "The fact that a claimed species or subgenus is

encompassed by a prior art genus is not sufficient by itself to establish a *prima facie* use of obviousness." MPEP§ 2144.08 (II).

Claim 2 is patentable over the art of record for the same reasons given above. In addition, the particular thickness of 4-10 microns for the P doped layer is not shown or suggested by the reference whose P doped layer is more than twice the upper limit of the claimed limitation.

Claim 3 is patentable over the art of record for the reasons given above for Claim 1.

Claims 4, 5 and 7 are patentable over the references for the reasons given above in connection with Claim 1. In addition, their particular limitations are also not shown or suggested in the art of record. The Office Action admits that the specific ranges and limitations shown in the claims are not shown in the reference. The only justification for rejecting the claims based on the references is that the claimed limitations are "within the skill of an artisan" or otherwise "subject to routine experimentation and optimization." First of all, it is irrelevant that an artisan has the skill to achieve the claimed doping levels. What is relevant is whether the references show or suggest placing such doping levels into a device. The references wholly fail to show or suggest that level of doping.

Nor do the references support the routine experimentation and optimization rejection. That rejection is also improper. It is simply a new way of stating that it is "obvious to try."

Finally, the references fail to teach those skilled in the art to experiment with doping levels and to experiment in the direction that is claimed by Claims 4-5 and 7.

Claim 6 is patentable for the same reason given above for Claim 1.

Claim 8 is patentable over the art of record. Claim 8 provides for a range of dopant levels between  $10^{14}$  and  $10^{15}$ . In other words, the upper limit of the range is more than 10 times the lower limit. In contrast, Fig. 9 of the '428 reference shows a relatively fixed range of dopant at  $10^{14}$ . The reference does not show or suggest the tenfold spread of Claim 8.


Claims 9-11 are also patentable over the art of record for the reasons given above in connection with Claim 1. Claim 12 is likewise patentable for the reasons given above for Claim 1.

The impurity concentrations set forth in Claims 13 and 14 are admittedly not shown in the reference. Again, the rejection points to no suggestion in the reference to vary from what the reference expressly teaches and thus Claims 13 and 14 are likewise patentable over the art of record.

Claims 15-17 are patentable for the reasons given above with Claim 1. To reiterate, the '428 and '858 references fail to teach or even suggest two of the limitations of Claim 1. The rejection also admits that they fail to show or suggest using their own invention in a MOSFET or IGBT. The Tokura, et al. reference does not suggest looking to either the '428 or '858 for any improvements. Thus, the combination of the three references is not suggested by anyone where the other of the references.

Having this distinguished the invention from the art of the record, Applicants request a Notice of Allowance.

Respectfully submitted,

  
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